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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/918,463	08/01/2001	Yongju Jung	1567.1014	2888
49455	7590	04/14/2006	EXAMINER	
STEIN, MCEWEN & BUI, LLP 1400 EYE STREET, NW SUITE 300 WASHINGTON, DC 20005			DOVE, TRACY MAE	
			ART UNIT	PAPER NUMBER
			1745	

DATE MAILED: 04/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/918,463

Applicant(s)

JUNG ET AL.

Examiner

Tracy Dove

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4,7-16,19,20,23,26,32,33,36 and 37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4,7-16,19,20,23,26,32,33,36 and 37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date: 20051125.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the communication filed on 3/31/06. Applicant's arguments have been considered, but are not persuasive. Claims 1, 4, 7-16, 19, 20, 23, 26, 32, 33, 36 and 37 are pending.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/31/06 has been entered.

Claims Analysis

Claim 19 recites "An electrolyte...comprising...wherein a positive electrode of the lithium sulfur battery has a porosity". The positive electrode porosity limitation of claim 19 is not given patentable weight because the claim is directed toward an electrolyte. Specifically, the positive electrode porosity does not further limit the claimed electrolyte.

Claim Objections

Claims 4 and 23 are objected to because of the following informalities: the Markush group should be closed by "and". Specifically, "and" should be inserted before "heterocyclic compounds". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4, 7-16, 19, 20, 23, 26, 32, 33, 36 and 37 are rejected under 35

U.S.C. 102(e)/103(a) as being anticipated by, or alternatively unpatentable over, Thibault et al., US 6,190,426.

Thibault teaches a lithium/sulfur battery comprising an anode, a cathode and an electrolyte. The anode comprises an anode active material preferably selected from the group consisting of lithium metal, lithium-intercalated carbon and lithium-intercalated graphite. The cathode comprises a cathode active material comprising a sulfur-containing material such as elemental sulfur and having a porosity in the range of 20-75 percent by volume (8:58-9:10). The cathode may further comprise conductive additives, binders, electrolytes and other additives (23:16-32). The positive electrode may comprise an aluminum or tin metallic layer (32:32-49). The positive electrode active material may comprise titanium sulfide or manganese oxide (23:33-40). The cathode tabs may be tin (29:53-55). The electrolyte may be a liquid electrolyte

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comprising an ionic lithium salt and one or more electrolyte solvents selected from the group consisting of aliphatic ethers, cyclic ethers, glymes, dioxolanes, sulfolanes, N-alkylpyrrolidones, carbonates, sulfones, siloxanes, acetonitrile, N-methyl acetamide, substituted forms thereof and blends thereof (28:29-36). The lithium salt may preferably be LiSO_3CF_3 (28:63-29:22).

Aliphatic ethers, cyclic ethers, glymes and carbonates are considered the weak polar solvents of the claimed invention. Sulfolanes, carbonates, acetonitrile, N-alkylpyrrolidones and N-methyl acetamide are considered the strong polar solvents of the claimed invention. Dioxolanes are considered the lithium protect solvents of the claimed invention.

Thus the claims are anticipated.

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Claims 19, 20, 23, 26 and 32 are rejected under 35 U.S.C. 102(b)/103(a) as being anticipated by, or alternatively unpatentable over, Evans et al., US 4,302,520.

Evans teaches an electrochemical cell comprising a solid cathode material, a lithium anode and an organic electrolyte. The solid cathode material includes metallic bismuth, metallic sulfur and metallic iron or lead. The electrolyte includes a mixed solvent and a solute (abstract). The cathode may include a conductive agent (2:20-21). The anode may comprise lithium or a lithium alloy (2:46-55). Preferred solvents for the electrolyte include sulfolane (strong polar), acetonitrile (strong polar), tetrahydrofuran (lithium protect), methyl tetrahydrofuran (weak polar), dioxolane (lithium protect), 3-methyl-2-oxazolidone (strong polar), propylene carbonate (strong polar), butyrolatone (strong polar), ethylene glycol sulfite (strong polar), dimethylsulfite (strong polar), dimethyl sulfoxide and dimethoxyethane (weak polar) (4:28-39). The best electrolyte solvent is a 3-methyl-2-oxazolidone (3M2O) based electrolyte. Low viscosity

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solvents may be used as cosolvents with the 3M2O solvent. The low viscosity solvents are listed at col. 4, lines 62-col. 5, lines 4. Example 1 teaches an electrolyte comprising a mixed solvent and a LiCF_3SO_3 salt. The mixed solvent comprises dioxolane (lithium protect), dimethoxyethane (weak polar), 3M2O (strong polar) and dimethylisoxazole (lithium protect). Furthermore, Evans teaches at least seven of the members of the strong polar solvent Markush group as recited by the claimed invention. Also disclosed by Evans are at least two members of the weak polar solvent Markush group and at least two members of the lithium protection solvent Markush group as recited by the claimed invention. The electrolyte is a mixed solvent.

Thus the claims are anticipated.

The claims are alternatively unpatentable. Evans does not teach a specific example of the claimed mixed organic solvents. However, Applicant's own disclosure teaches that 3-methyl-2-oxazolidone may be used as the strong solvent. The claims have been amended to delete "3-methyl-2-oxazolidone" (3M2O) merely to try to overcome the prior art of record. No support is found in the specification for the deletion of 3M2O. Applicant's invention does not disclose any rationale for the deletion of 3M2O or why 3M2O could not function as the strong polar solvent. Furthermore, the courts have ruled that by the presentation of a Markush group for the strong polar solvents, Applicant has made the representation that for the purpose of the present invention, the elements of the group are equivalents. Having made this representation, Applicant may not now argue that these two elements are not equivalents. In re Skoll, 187 USPQ 481 (CCPA 1975). Thus, the invention would have been obvious to one of skill because 3M2O is considered equivalent to the strong polar solvents recited by the claimed invention.

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Claims 19, 20, 23, 26 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vourlis, US 5,432,030.

Vourlis teaches a lithium/FeS₂ rechargeable electrochemical cell comprising an electrolyte including a solvent mixture of 3-methyl-2-oxazolidone (strong polar), 1,3-dioxolane (lithium protect) and 1,2-dimethoxyethane (weak polar) with a LiCF₃SO₃ salt. See abstract. FeS₂ is a sulfur based compound comprising an iron additive. The anode may contain lithium or a lithium alloy (3:42-45). The cathode may contain a conductive material and a binder (Ex. 1). The cathode material is coated on a current collector (Ex. 4). The cathode may contain In₂S₃, Pb₃O₄ or TiS₂ (1:47-50).

Vourlis does not explicitly teach the strong polar solvent, as currently claimed.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Applicant's own disclosure teaches that 3-methyl-2-oxazolidone may be used as the strong solvent. The claims have been amended to delete "3-methyl-2-oxazolidone" (3M2O) merely to overcome the prior art of record. No support is found in the specification for the deletion of 3M2O. Applicant's invention does not disclose any rational for the deletion of 3M2O or why 3M2O could not function as the strong polar solvent. Furthermore, the courts have ruled that by the presentation of a Markush group for the strong polar solvents, Applicant has made the representation that for the purpose of the present invention, the elements of the group are equivalents. Having made this representation, Applicant may not now argue that these two elements are not equivalents. In re Skoll, 187 USPQ 481 (CCPA 1975). Thus, the invention would have been obvious to one of skill because 3M2O is considered equivalent to the strong polar solvents recited by the claimed invention.

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Claims 1, 4, 7-16, 33, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vourlis, US 5,432,030 or Evans et al., US 4,302,520 in view of Thibault et al., US 6,190,426.

See discussion of Vourlis and Evans above. Neither Vourlis nor Evans teaches the porosity of the positive electrode. Both references are silent regarding positive electrode porosity.

However, Thibault teaches a lithium/sulfur battery comprising a cathode having a porosity in the range of 20-75 percent by volume (8:58-9-10). Liquid electrolytes for the lithium/sulfur battery are disclosed at column 28, lines 29-36 and column 28, line 63-column 29, line 22. Therefore, one of skill would have been motivated to provide the sulfur positive electrode of Evans or Vourlis with a porosity in the range of 20-75 percent by volume because Thibault teaches this porosity is known in the art for sulfur positive electrodes in lithium sulfur batteries.

Response to Arguments

Applicant's arguments filed 3/31/06 have been fully considered but they are not persuasive.

Claims 19, 20, 23, 26 and 32 are rejected under 35 U.S.C. 102(b)/103(a) as being anticipated by, or alternatively unpatentable over, Evans et al., US 4,302,520. Applicant argues Evans fails to teach or suggest the porosity of the positive electrode. However, claim 19 is directed toward "an electrolyte", therefore, limitations of the positive electrode are not given patentable weight because such limitations do not further limit the claimed "electrolyte".

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Claims 19, 20, 23, 26 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vourlis, US 5,432,030. Applicant argues Vourlis fails to teach or suggest the porosity of the positive electrode. However, claim 19 is directed toward "an electrolyte", therefore, limitations of the positive electrode are not given patentable weight because such limitations do not further limit the claimed "electrolyte".

Katz is no longer applied the reject the pending claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

April 13, 2006


TRACY DOVE
PRIMARY EXAMINER